

# Climate Change Draft Scoping Plan

## Public Health Analysis Supplement

*Pursuant to AB 32  
The California Global Warming Solutions Act of 2006*

*Prepared by*  
the California Air Resources Board  
for the State of California

Arnold Schwarzenegger  
*Governor*

Linda S. Adams  
*Secretary, California Environmental Protection Agency*

Mary D. Nichols  
*Chairman, Air Resources Board*

James N. Goldstene  
*Executive Officer, Air Resources Board*

## **Table of Contents**

Executive Summary

Attachment A: Public Health and Environmental Benefits of Draft Scoping Plan Measures

Attachment B: Regional Assessment of Public Health Benefits of Draft Scoping Plan: South Coast Air Basin

Attachment C: Community Level Assessment of Public Health Benefits of Draft Scoping Plan: Wilmington Example

Attachment D: Method Used to Quantify Health benefits of Draft Scoping Plan Co-Pollutant Emission Reductions: Quantification of the Health Impacts and Economic Valuation of Air Pollution from “Ports and Goods Movement in California from Proposed Emission Reduction Plan for Ports and Goods Movement In California” (March 2006)

Attachment E: Overview of Regulatory Programs for Criteria and Toxic Air Pollutants in California

## Executive Summary

### Overview

AB 32 requires the California Air Resources Board (ARB) to evaluate the environmental and public health impacts of the Scoping Plan. This analysis is focused primarily on the quantification of public health benefits from air quality improvements that would result from implementation of the Draft Scoping Plan. Unlike traditional pollutants, and toxic emissions, global warming pollutants do not typically have localized impacts. At ambient levels, carbon dioxide (which makes up over 80 percent of global warming pollutants in California) has no direct environmental or public health consequences. Greenhouse gas pollutants emitted in another state or country have the same potential to damage our public health and the environment as do climate change pollutants emitted within California. Many of the measures aimed at reducing global warming pollutants also provide co-benefits to public health and California's natural resources.

Analyses of the environmental and cumulative impacts of the Plan will be undertaken in the California Environmental Quality Act (CEQA) document for the Proposed Scoping Plan. As the Scoping Plan is implemented, and specific measures are developed, ARB will conduct further CEQA analyses, including cumulative and multi-media impacts. ARB recognizes that the adoption of the Scoping Plan will launch a variety of regulatory proceedings in many different venues. ARB will work closely with other agencies including the Office of Planning and Research, the California Environmental Protection Agency, Resources Agency, the California Integrated Waste Management Board, the Department of Public Health, the Office of Environmental Health Hazard Assessment, the State Water Resources Control Board, the Department of Toxic Substances Control, the Department of Water Resources, the Board of Forestry, the Department of Fish and Game, and California Energy Commission and others, to identify and address potential multi-media environmental impacts early in the regulatory development process.

California's actions to reduce greenhouse gas emissions will help transition the State to new technologies, improved efficiencies, and land use patterns also necessary to meet air quality standards and other public health goals. California's challenging public health issues associated with air pollution are already the focus of comprehensive regulatory and incentive programs. These programs are reducing smog forming pollutants and toxic diesel particulate matter at a rapid pace. However, to meet increasingly stringent air quality standards and air toxics reduction goals, transformative changes are needed in the 2020 timeframe and beyond. Implementation of AB 32, the Global Warming Solutions Act of 2006, will provide additional support to existing state efforts devoted to protecting and improving public health.

### **Key Public Health Benefits of the Preliminary Recommendation of the Draft Scoping Plan**

- Approximately 320 premature deaths statewide would be avoided in 2020 under the preliminary recommendation in the Draft Scoping Plan. This is in addition to an estimated 3,700 avoided premature deaths in 2020 due to existing and planned California air quality programs.
- Almost 9,000 incidences of asthma and lower respiratory symptoms, and 53,000 work loss days would be avoided with the implementation of the preliminary recommendation in the Draft Scoping Plan.

The primary direct public health benefits of the Draft Scoping Plan are reductions in smog forming emissions and toxic diesel particulate matter. The most significant reductions are of oxides of nitrogen (NOx), which forms both ozone and particulate pollution (PM2.5), and directly emitted PM2.5, which includes diesel particulate matter. This supplemental analysis focuses on PM2.5 impacts, and quantifies 2020 public health benefits of the Draft Scoping Plan in terms of avoided premature deaths, hospitalizations, respiratory effects, and lost work days. Additional benefits associated with the reductions in ozone forming emissions were not quantified since statewide 2020 photochemical modeling is not available.

The estimated public health benefits of the Draft Scoping Plan are above and beyond the much greater benefits of California's existing programs, which are reducing air pollutant emissions every year. This continuing progress is the result of California's plans for meeting air quality standards ("State Implementation Plans" or SIPs), reducing emissions from goods movement activities, and addressing health risk from diesel particulate matter. These programs address both existing and new sources of air pollution, taking into account population and economic growth. The additional benefits of the Draft Scoping Plan in 2020 are significant, and in the longer term, can be expected to increase with further reductions in fossil fuel combustion, the primary basis for the estimated public health benefits.

The recommended measures in the Draft Scoping Plan that reduce smog forming ("criteria") pollutants are shown in Table 1 along with the estimated reductions.<sup>1</sup> Statewide, these measures would reduce approximately 56 tons per day of NOx and 12 tons per day of PM2.5 in 2020. As shown in Table 2, this equates to an estimated public health benefit of 320 avoided premature deaths statewide. In comparison, reductions in PM2.5 from California's existing programs and 2007 SIP measures are estimated to result in 3,700 avoided premature deaths statewide in the same timeframe.

---

<sup>1</sup> Table 1 does not include the criteria pollutant co-benefits of additional GHG reductions that would be achieved from the proposed cap-and-trade regulation because we cannot predict in which sectors they would be achieved.

**Table 1: Statewide Criteria Pollutant Emission Reductions in 2020 from Draft Scoping Plan Preliminary Recommendation <sup>2</sup>**  
(tons per day)

<b>Measure</b>	<b>NOx</b>	<b>PM2.5</b>
Light-Duty Vehicle <ul style="list-style-type: none"> <li>• Pavley 1 and Pavley 2 GHG Standards</li> <li>• Vehicle Efficiency Measures</li> </ul>	1.6	1.5
Goods Movement Efficiency Measures	16.6	0.6
Medium and Heavy-Duty Vehicle GHG Emission Reduction <ul style="list-style-type: none"> <li>• Aerodynamic Efficiency</li> <li>• Hybridization</li> <li>• Engine Efficiency</li> </ul>	5.6	0.2
Local Government Actions and Regional Targets	3.5	0.6
Energy Efficiency and Conservation (Electricity)	7.0	4.0
Energy Efficiency and Conservation (Natural Gas)	10.4	0.8
Solar Water Heating	0.3	0.03
Million Solar Roofs	1.0	0.6
Renewables Portfolio Standard	9.8	3.7
<b>Total</b>	<b>56</b>	<b>12</b>

**Table 2: Estimates of Statewide Health Benefits in 2020**

<b>Health Endpoint</b>	<b>Health Benefits of Existing Measures and 2007 SIP</b>	<b>Health Benefits of Preliminary Recommendation in the Draft Scoping Plan (Transportation and Electricity and Natural Gas Sectors)</b>
	<i>mean</i>	<i>mean</i>
Avoided Premature Death	3,700	320
Avoided Hospital Admissions for Respiratory Causes	770	67
Avoided Hospital Admissions for Cardiovascular Causes	1,400	120
Avoided Asthma and Lower Respiratory Symptoms	110,000	8,800
Avoided Acute Bronchitis	8,700	730
Avoided Work Loss Days	620,000	53,000
Avoided Minor Restricted Activity Days	3,600,000	310,000

<sup>2</sup> Table 1 does not include the criteria pollutant co-benefits of additional GHG reductions that would be achieved from the proposed cap-and-trade regulation because we cannot predict in which sectors they would be achieved.

In addition to the quantified health benefits, our analysis indicates that implementation of the Draft Scoping Plan can deliver other public health benefits as well. These include potential health benefits associated with local and regional transportation-related greenhouse gas targets that can facilitate greater use of alternative modes of transportation such as walking and bicycling. These types of moderate physical activities reduce many serious health risks including coronary heart disease, diabetes, hypertension and obesity.<sup>3</sup> Finally, it is important to note that the steps California is taking to address global warming, along with actions by other regions, states, and nations, will help mitigate the public health effects of heat waves, more widespread incidence of illness and disease, and other potentially severe impacts.

The measures in the Draft Scoping Plan are designed primarily to help spur the transition to a lower carbon economy. However, in addition to improving air quality, these measures can also improve California's environmental resources including land, water, and native species. Land resources will be affected by regional transportation-related targets leading to improved land use planning, and forest carbon sequestration targets which can result in better stewardship of California lands and reduce wildfire risk. A number of conservation measures will aid in effective management of the State's precious water resources. Demand for waste disposal and hazardous materials should decrease as measures to encourage recycling and reuse transform our wastes into fuel, energy, and other useful products are implemented. Additional analysis of the way that implementation of the Scoping Plan will impact these environmental resources will be conducted as we proceed.

### **Approach**

AB 32 requires ARB to "evaluate the total potential costs and total potential economic and noneconomic benefits of the [Scoping Plan] to California's economy, environment and public health, using the best available economic models, emission estimation techniques and other scientific methods" (Health and Safety Code (HSC) §38562(c)). This supplemental analysis focuses primarily on the quantifiable air quality-related public health benefits of the Draft Scoping Plan. As noted, further analyses of the environmental impacts of the plan will be undertaken as part of our requirement to comply with the California Environmental Quality Act and we will also be analyzing the environmental impacts of specific measures in the plan they are further developed in the regulatory process.

We quantified the potential reductions of NO<sub>x</sub> and PM<sub>2.5</sub> from implementation of the preliminary recommendations, and the public health benefits associated with the resulting potential air quality improvement. The methodology used to evaluate the public health benefits of the emission reductions is similar to the methodology used in ARB's 2006 Goods Movement Emission Reduction Plan (GMERP) and is included in Attachment D as a reference. This methodology is based on a peer-reviewed methodology developed by the U.S. Environmental Protection Agency (EPA). ARB augmented EPA's methodology by incorporating the result of new epidemiological studies relevant to California's population, including regionally specific studies, as they became available.

AB 32 directs ARB to conduct several levels of analysis as we proceed through the development and implementation of a comprehensive greenhouse gas reduction strategy. As part of the Scoping

---

<sup>3</sup> Attachment A contains a reference list of studies documenting the public health benefits of alternative transportation.

Plan development, we are required to assess both the economic and non-economic impacts of the plan as noted above. Additionally, AB 32 requires ARB to undertake additional analysis at the time of adoption of regulations, including market-based compliance mechanisms.

Although we are not yet at the stage of regulatory development and adoption, in this analysis we have conducted a preliminary evaluation of the potential air quality-related public health impacts associated with market-based regulations in the Draft Scoping Plan based on an example community level emissions analysis. As regulations that rely on market-based compliance mechanisms are further developed for consideration by the Board, more detail about the specific regulatory proposals will be developed, allowing ARB to more closely evaluate the potential for direct, indirect and cumulative impacts.

### **Existing Programs for Air Quality Improvement in California**

This analysis presents public health benefits of the Draft Scoping Plan that are in addition to the benefits of California's comprehensive air quality programs to meet health-based standards and reduce health risk from air toxics. It is also important to note that under both a "business-as-usual" scenario and under the implementation of the Draft Scoping Plan, the population and economy of California are projected to continue to grow.<sup>4</sup> New businesses and industries will continue to site in California, bringing both economic opportunity and potential environmental impacts. Federal, state, and local laws and regulations have established requirements to ensure that new and modified sources of pollution are carefully evaluated and that significant impacts are mitigated. Emissions from existing businesses are also tightly controlled by local air pollution control districts. Statewide programs are in place to reduce emissions from cars, trucks, and off-road equipment, along with smog check, cleaner gasoline and diesel fuels, and regulations to reduce evaporative emissions from consumer products, paints, and refueling. Additional information about the existing regulatory framework for sources of air pollution is provided in Attachment E.

It is important to evaluate the air quality and public health benefits of the Draft Scoping Plan in the context of the State's on-going air quality improvement efforts. California's long-standing air pollution control programs have substantially improved air quality in the state, and will continue to do so in the future. By 2020, these programs will deliver reductions in statewide NOx emissions of 441 tons per day and direct fine particle emission reductions of 34 tons per day. Through 2020 three key ARB efforts will deliver deep cuts in air pollutant emissions despite continuing growth:

- Diesel Risk Reduction Plan
- Goods Movement Emission Reduction Plan
- 2007 State Implementation Plan

Measures in these plans will result in the accelerated phase-in of cleaner technology for virtually all of California's diesel engine fleets including trucks, buses, construction equipment, and cargo handling equipment at ports. Adoption and implementation of these and other measures are critical to achieving clean air and public health goals statewide.

---

<sup>4</sup> Economic Analysis Supplement to the Draft Scoping Plan, September 2008.

The U.S. Environmental Protection Agency has set a new, more stringent, national ambient air quality standard for ozone that will have compliance deadlines well past 2020 for the most severely impacted areas like southern California.<sup>5</sup> The unmitigated impacts of climate change will make it harder to meet this standard and to provide healthful air to Californians.

## **Summary and Results**

The Draft Scoping Plan includes an emissions and public health analysis based on anticipated reductions in fuel use associated with the recommended sector-specific measures. The analyses in this evaluation update and replace the Draft Scoping Plan analysis, providing a more detailed statewide evaluation of each recommended measure, as well as examples of potential regional and community level impacts, primarily in terms of air quality impacts.

### **1. Statewide Analysis**

ARB's statewide environmental evaluation of the benefits of the preliminary recommendation in the Draft Scoping Plan is provided in Attachment A. For this evaluation, ARB examined each recommended measure in the transportation, energy, and industrial sector to determine the potential for impacts on air, land, water, native species and biological resources, and waste and hazardous materials. As noted, the main focus of this analysis is on air quality. To the extent feasible, ARB quantified estimated emissions reductions in criteria pollutants associated with each recommended measure except cap and trade. Reductions in NO<sub>x</sub> and PM<sub>2.5</sub> were used to estimate public health benefits. The estimated statewide reductions are 56 tons per day of NO<sub>x</sub> and 12 tons per day of PM<sub>2.5</sub> from recommended measures in the transportation, energy, and industrial sectors. Further analysis of the potential criteria pollutant benefits of a cap-and-trade program would be done as part of regulatory development.

### **2. Regional Assessment: South Coast Air Basin Example**

In order to assess potential benefits of the Draft Scoping Plan on a regional level, ARB evaluated associated criteria pollutant reductions in the South Coast Air Basin as an example case. The analysis is described in more detail in Attachment B. Existing programs will reduce current NO<sub>x</sub> emissions by almost 50 percent in 2020. With the new 2007 SIP measures, NO<sub>x</sub> emissions will be reduced almost 60 percent. Because of the large population and high pollutant concentrations in this region, greater benefits occur from each ton of pollution reduced. The estimated public health benefits of the Draft Scoping Plan for the South Coast region are shown in Table 3. The significant public health benefits in this region are largely attributed to the additional reductions in PM<sub>2.5</sub>.

---

<sup>5</sup> <http://www.epa.gov/air/ozonepollution/actions.html>.



**Table 3: Estimated Health Benefits of Existing Program, 2007 SIP, and Draft Scoping Plan In the South Coast Air Basin, 2020**

<b>Health Impacts / Scenario</b>	<b>Benefits from Existing Program</b>	<b>Additional Benefits from 2007 SIP</b>	<b>Additional Co-Benefits from Draft Scoping Plan</b>
Premature Deaths Avoided	1,600	920	160
Hospitalizations Avoided – Respiratory	330	200	33
Hospitalizations Avoided – Cardiovascular	610	360	62
Asthma & Lower Respiratory Symptoms Avoided	46,000	28,000	4,700
Acute Bronchitis Avoided	3,800	2,300	390
Work Loss Days Avoided	270,000	160,000	28,000
Minor Restricted Activity Days Avoided	1,600,000	940,000	160,000

### **3. Community Level Assessment: Wilmington Example**

We also conducted a preliminary evaluation of the potential air quality impacts of the Draft Scoping Plan in the community of Wilmington as an illustration of the potential for localized impacts. This analysis is provided in Attachment C. Wilmington is in southern Los Angeles County and includes a diverse range of stationary and mobile sources including the ports of Los Angeles and Long Beach, railyards, major transportation corridors, refineries, power plants, and other industrial and commercial operations. Like the regional analysis, additional emission reductions from the 2007 SIP were estimated and show significant reductions in Wilmington by 2020 – approximately a 45 percent reduction in NOx and a 40 percent reduction in directly-emitted PM2.5. Mobile source emissions are projected to continue to be proportionately greater than stationary source emissions in 2020 even as mobile source emissions decline.

For this assessment, ARB evaluated criteria pollutant emission reductions in the Wilmington study area assuming that the source-specific quantified measures are implemented. It was further assumed that the non-source specific program elements such as the proposed cap-and-trade program result in a 10 percent reduction in fuel combustion by affected sources within the study area. For example, it is estimated that industrial sources would achieve greenhouse gas emission reductions through efficiency measures that reduce on site fuel use by 10 percent either in response to a cap and trade program, or due to the results of the facility energy efficiency audits. While it is likely that the actual onsite reductions will differ across individual facilities from the assumed uniform ten percent reduction<sup>6</sup>, the analysis identifies how reductions at these facilities affect the overall level of co-benefits.

---

<sup>6</sup> The reductions at any one facility could be much greater or lesser than 10 percent. For example very small or no reductions might occur because available cost-effective industrial emission reductions have already been implemented at a particular site.

The estimated NO<sub>x</sub> co-benefit of about 1.7 tons per day is small relative to the projected reductions of 24 tons per day that will occur as a result of the SIP and other measures. For example, an 8 ton per day NO<sub>x</sub> reduction is expected from cleaner port trucks. In comparison, the potential NO<sub>x</sub> benefit from a 10 percent efficiency improvement in major goods movement categories is estimated at about 1.5 tons per day. The estimated PM<sub>2.5</sub> co-benefits, on the order of 0.12 tons per day, are also small relative to the projected reductions of 2.3 tons per day that will occur as a result of the SIP and other measures. Approximately 30 percent (0.04 ton per day) of the PM<sub>2.5</sub> co-benefit reduction is associated with assumed energy efficiency measures at the four large refineries in the study area, while another 30 percent would occur due to a 10 percent efficiency improvement by goods movement sources.

The co-benefit emission reductions in the study area would produce health benefits for the population in the study area (approximately 300,000 area residents) as well as regional benefits among a much larger population. Health benefits due to reductions in NO<sub>x</sub> are mostly at the regional levels, since NO<sub>x</sub> emissions have usually travelled some distance before they are transformed into PM via atmospheric reactions. Point source combustion PM emissions persist in the atmosphere and increase exposures both in the area where they are emitted and broadly throughout the region. Based on previous modeling studies of the impact of port and rail yard PM emissions in the South Coast Air Basin conducted by the ARB, PM exposures will be reduced far beyond the study area, and a majority of the health benefits are expected to occur in areas outside of the Wilmington community.

Using the previously described methodology that correlates emission reductions in the air basin with expected health benefits<sup>7</sup> there would be approximately 11 avoided premature deaths. As the application of the general methodology for estimating health impacts in small populations and small geographic areas is still under development, the results in this section are presented for comparative purposes only.

## **Conclusion**

The Draft Scoping Plan presents a Preliminary Recommendation for reducing California's greenhouse gas emissions to 1990 levels by the year 2020. This analysis provides an initial assessment of the statewide public health benefits, with a focus on air quality, associated with implementation of the preliminary recommendation. The analysis indicates that implementation of AB 32 will deliver significant additional public health benefits beyond those that will be achieved by California's comprehensive air quality programs. The analysis also indicates that additional environmental impacts associated with implementation of the plan can be positive.

As noted, we will work with partner agencies and departments to conduct additional analyses of the measures recommended in the Scoping Plan as we move forward. These analyses will incorporate any new information that we discover as we proceed to ensure that a full assessment of the impacts of all of the measures in the Scoping Plan is conducted before they are implemented.

We are requesting comments on this Supplement as soon as possible, recognizing that comments on this document will not be able to be reflected in the October 3<sup>rd</sup> release of the Proposed Scoping

---

<sup>7</sup> See Attachment D

Plan. The October 3<sup>rd</sup> Proposed Scoping Plan will contain a public health assessment of the final staff recommendation and it will be available for additional public comment.

Comments received on this document will be considered along with all other comments about the measures and the public health analysis in the Proposed Scoping Plan that will be considered by the Board at its November hearing.

Staff will provide an update at the November Board meeting as needed to respond to comments received on the analysis that is included with October 3<sup>rd</sup> Proposed Scoping Plan. The public health and environmental impact of the proposal will be one of a number of factors that the Board will weigh when it considers adoption of the Proposed Plan at its November hearing.